Track reconstruction in the Near Detector update

N. Saoulidou, Fermilab

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Outline

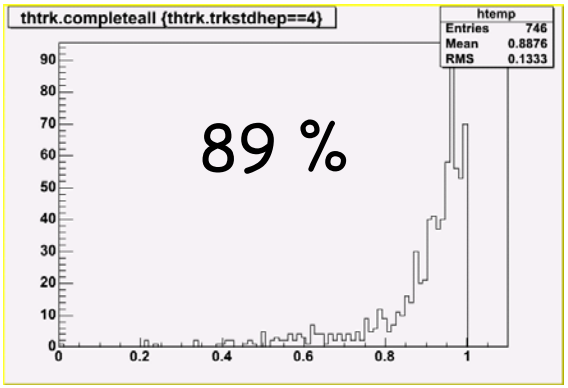
- Effect of a few corrections on all tracking parameters (efficiency purity and completeness).
- Effect of new slicing algorithm on ND track characteristics.
- Future work

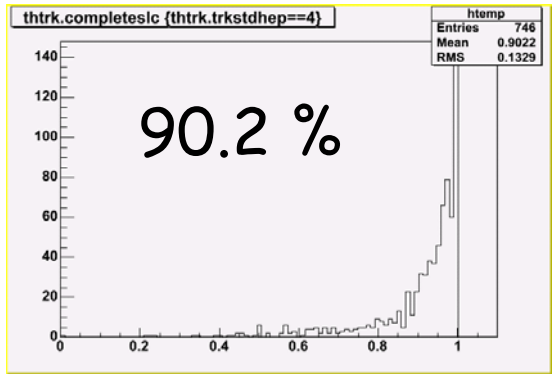
Modifications & Corrections on ND tracking

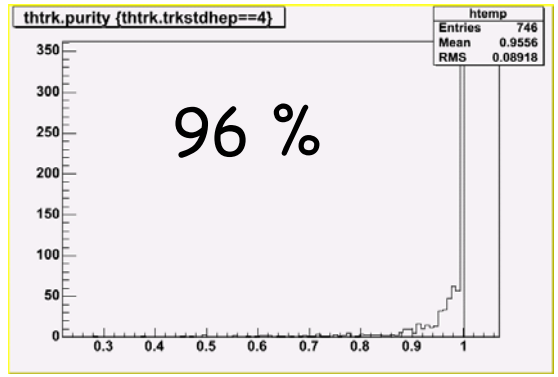
- Modification on the way "duplicate" 3D tracks are examined :
  - Initially the percentage of identical hits was examined for all track strips (U and V together).
  - There were some cases were false 3D solutions existed having the correct 2D Line in one view and the wrong 2D Line in the other view.
  - The code is now modified to examine percentage of identical strips in each view and keep the solution with the largest number of planes.
  - **Fixed an additional bug in this procedure.**
- Fixed a bug related with chi2 initialization (thanks to Robert).
- Changed tracking parameter aiming in higher efficiencies especially in lower energies

Track Reconstruction Completeness, Completeness after slicing and Purity (MUONS).

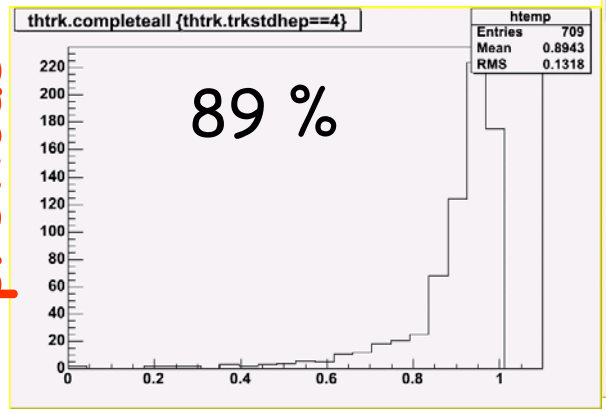
current

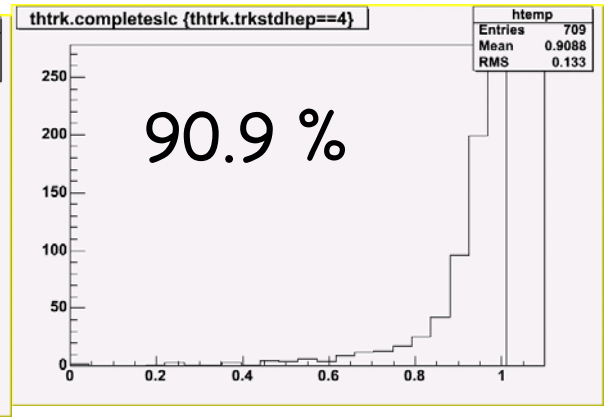


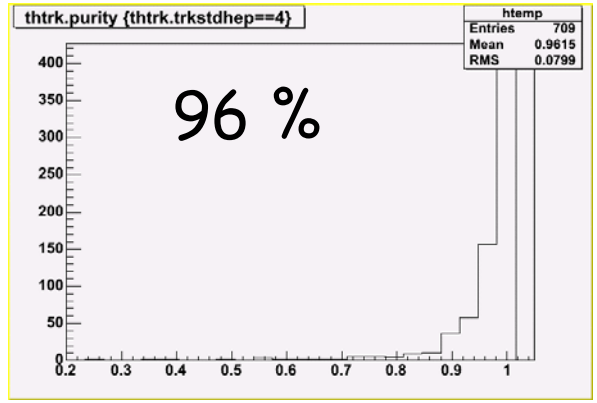




previous





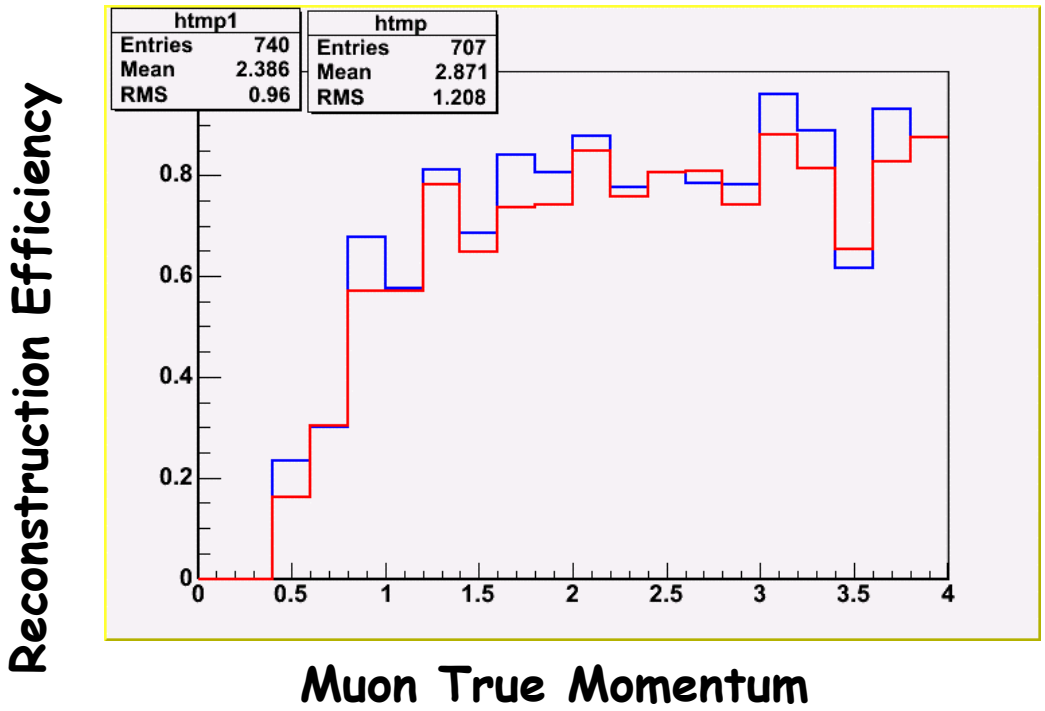


Completeness | Completeness after slicing | Purity

- Track completeness (unchanged) Track completeness (after slicing) (unchanged) & Track purity (unchanged).

Track reconstruction characteristics in the ND

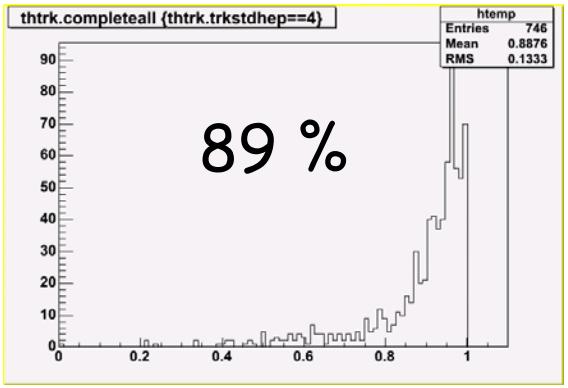
Reconstruction efficiencies as a function of muon true momentum

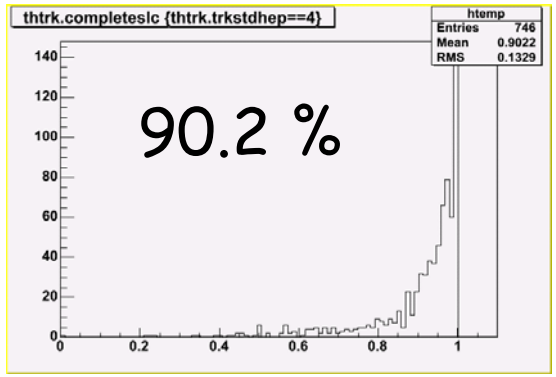


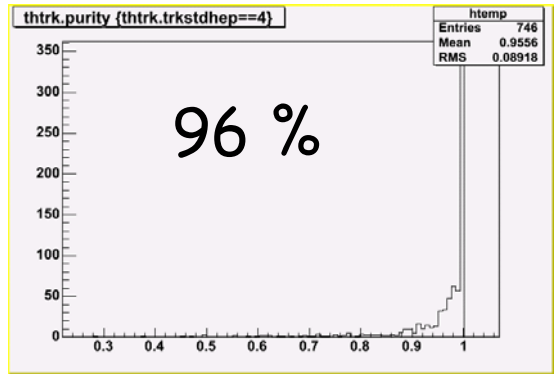
- Although statistics is small (but the events I am processing are the same), it seems like the track reconstruction efficiency has increased by ~ 5 % in lower muon energies as well.
- I am continuing to study reasons of inefficiencies at lower energies…

Track Reconstruction Completeness, and Purity (MUONS) after some recent changes in the SLICER...

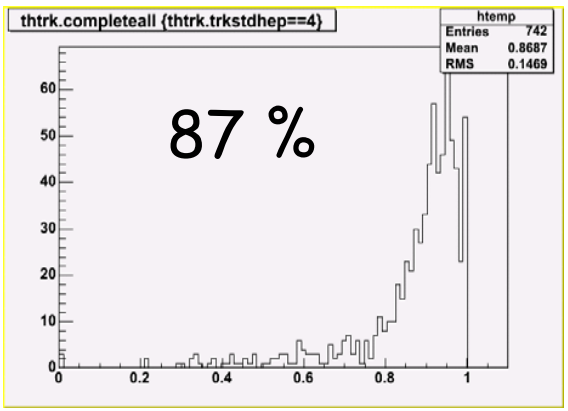
current

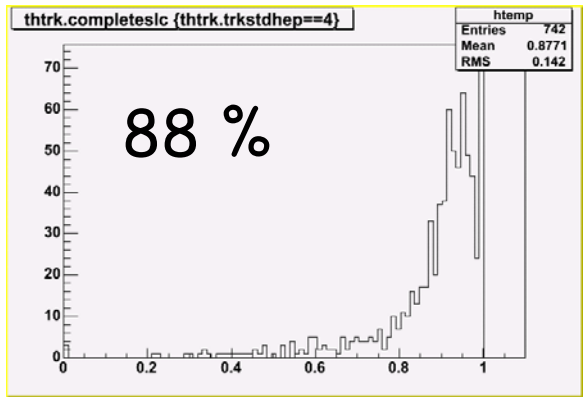


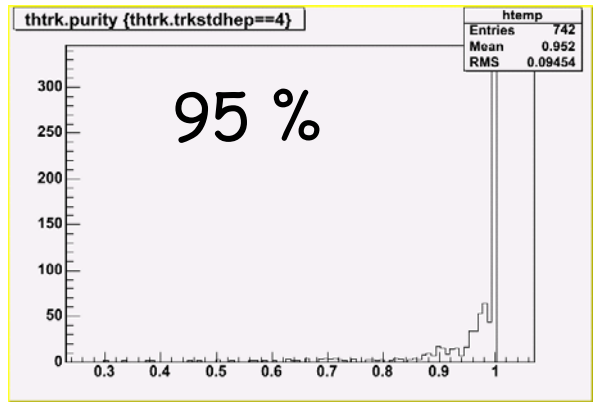




SLICER changes



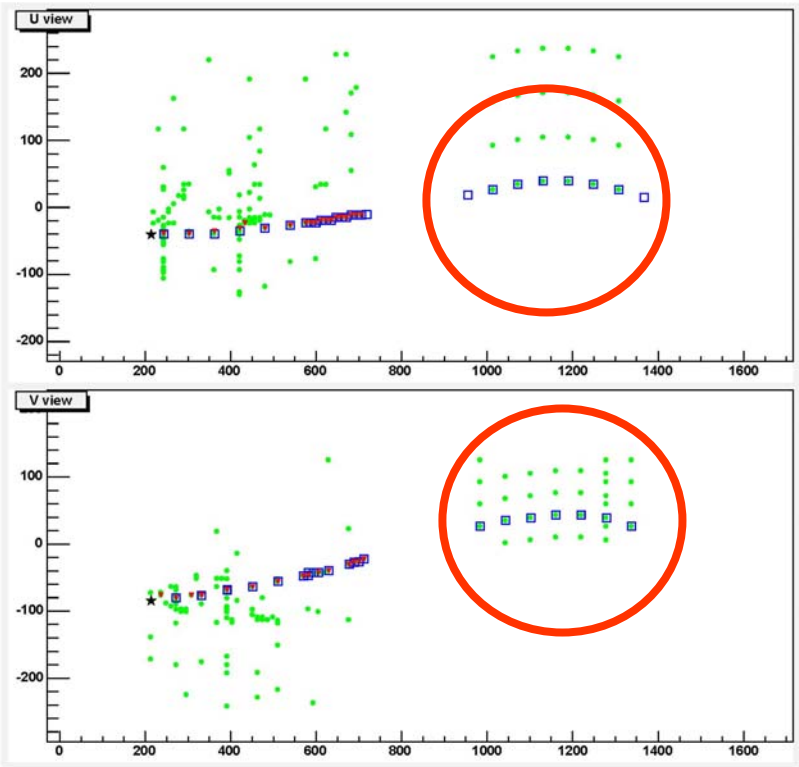


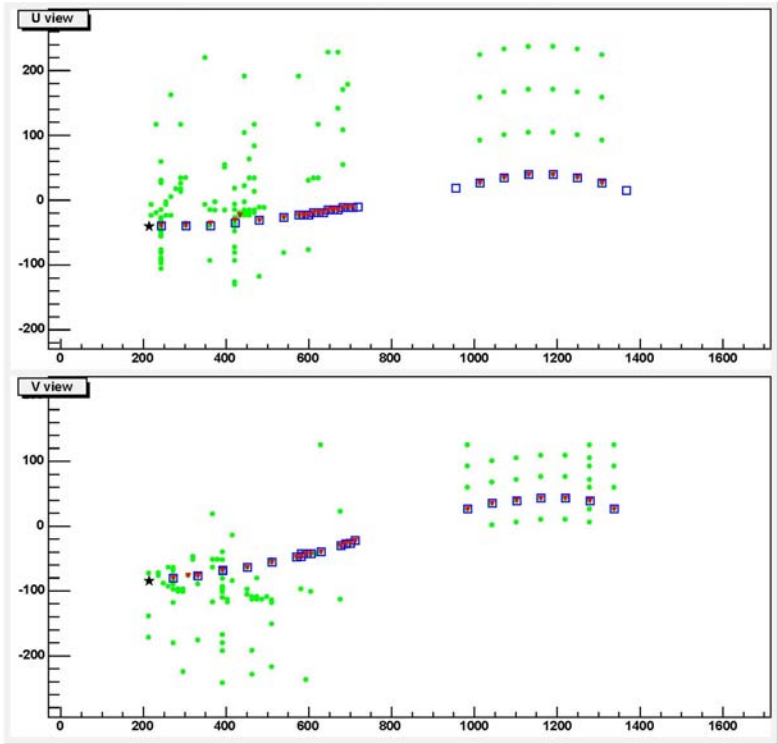


Completeness | Completeness after slicing | Purity

- Track completeness **has decreased by 2%** Track completeness (after slicing) **has decreased by 2 % &** Track purity **has decreased by 1%.**

Track *pathologies* after some recent changes in the SLICER...





- After these changes in the Slicer tracks appear to miss hits in the spectrometer region because simply the strips do not belong in this slice anymore.
- That can introduce biases in muon momentum estimation and event classification…

Conclusions & On going work

- Making some additional improvements to the ND tracking code the track reconstruction efficiency has been increased, while track characteristics are kept at least unchanged.

- Some changes in the SLICER that are related with relatively strict topological cuts affect the ND tracking, and especially track completeness in a bad way. That could introduced biases and should be handled with care….

- I will continue to investigate track (in)efficiencies at lower muon momenta.

- After I fully understand the current status of ND tracking (after various changes e.t.c) I will examine track reconstruction results on the overlay file.